# ULTRASONOGRAPHY AND SCINTIGRAPHIC FINDINGS IN PATIENTS PRESENTING WITH THYROID DISEASES AT MUHIMBILI NATIONAL HOSPITALS AND OCEAN ROAD CANCER INSTITUTE

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Hospital-based descriptive Cross Section Study

By

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**A dissertation submitted in (Partial) Fulfillment of the Requirements for the Degree of Master of Medicine in Diagnostic Radiology of Muhimbili University of Health and Allied Sciences**

**October, 2019**

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**"ULTRASONOGRAPHY AND SCINTIGRAPHIC FINDINGS IN PATIENTS PRESENTING WITH THYROID DISEASE AT MUHIMBILI NATIONAL HOSPITALS AND OCEAN ROAD CANCER INSTITUTE"**

In partial fulfillment of the requirement of Masters of Medicine (Diagnostic Radiology) of Muhimbili University

**……..** **……**

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**DEDICATION**

This dissertation is dedicated to my wife Dinah Simon Rhobi wangwe for her special care and support of our family during my absence.

**ABBREVIATIONS**

| | | |
|---|---|---|
| FNAB | - | Fine needle aspiration biopsy |
| FNAC- | | Fine needle aspiration cytology |
| MEN-II | - | Multiple endocrine neoplasia types 2 |
| MNH | - | Muhimbili National Hospital |
| MUHAS | - | Muhimbili University of Health and Allied Sciences |
| PTC | - | Papillary thyroid carcinoma |
| RLN | - | Recurrent laryngeal nerve |
| TFT | - | Thyroid functional test |
| TSH | - | Thyroid stimulating hormone |
| US-FANB | - | Ultrasound-guided fine needle aspiration biopsy |
| USS | - | Ultrasonography scan (Ultrasound) |

**DEFINITION OF TERMS**

**Ultrasound (US)** Is an imaging technology that uses high-frequency sound waves to characterize tissue. It is a useful and flexible modality in medical imaging, and often provides an additional or unique characterization of tissues, compared with other modalities such as conventional radiography or CT

**Transducer** - The part of the ultrasound unit that converts electrical energy into mechanical (sound) energy and back again, based on the piezoelectric effect. It is the hand-held part of the ultrasound machine that is responsible for production and detection of ultrasound waves

**Sensitivity -** Is the ability of a test to correctly identify those with the disease (true positive rate)

**Specificity** -. Is the ability of the test to correctly identify those without the disease (true negative rate).

**Scintigraphy**-Thyroid scintigraphy is a nuclear medicine procedure that produces a visual display of functional thyroid tissue based on the selective uptake of various radionuclides by thyroid tissue.

**Radiopharmaceutical agent** - Are drugs that are bound to radioactive substances. The pharmaceutically active portion determines the activity that will be measured and the radioactive portion emits radiation that can be measured by the scanner

**Thyroid nodules -** Are lumps that commonly arise within an otherwise normal thyroid gland. Most commonly, these abnormal growths of thyroid tissue do not produce any symptoms whatsoever

**Contrast media** - Are contrast agents that contain iodine atoms used for x-ray-based imaging modalities such as computed tomography (CT), although they are also used in fluoroscopy, angiography and venography, and even occasionally, plain radiography. Although the intravenous route of administration is most common, they are also administered by many other routes, including gastrointestinal (oral, rectal), cyst urethral, vaginal, intraosseous

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**ABSTRACT**

**Background:**

Thyroid diseases are common and serious diseases in the world and because of this fact, early diagnosis is necessary. Clinicians in our settings rely on clinical presentation, physical examination and biochemical findings in diagnosing patients with thyroid mass and sometimes this leads to misdiagnosis or late diagnosis of cancerous lesions.

Abnormal lymph node sometimes can be mistaken for a thyroid nodule. Clinical examination or biochemical findings becomes difficult to do differentiate between two conditions.

**Objective:** The aim of this study was to determine and compare ultrasound and scintigraphy findings in patients presenting with thyroid disease.

**Methodology**; A prospective study of 66 patient was done for a period of 6 months at Muhimbili National Hospital and Ocean Road Cancer Institute. Ultra-sonographic and scintigraphy findings of patients presenting with thyroid disease were done. Ultrasound scanning were done by Principle researcher and scintigraphy scanning were done by Radiographer and Result interpreted by principle researcher and senior radiologist.

**Results**; In this study, females were commonly affected by thyroid disease as compared with males. Out of 66 participants who attended 59 were females (89.4%). Prevalence of disease increases with age up to the age of 60 years with the mean age of 46.98 years (13.88 SD)

The most common clinical presentation in the patients who presented with thyroid diseases was neck swelling (Diffuse and Nodular). Other clinical presentations were dysphagia, hoarseness of voice, palpitation, and proptosis.

The most common thyroid disease diagnosed by sonography was multinodular goiter (60.6%) which had enlarged thyroid lobes with multiple nodules as the common sonographic findings. Graves' disease and Thyroiditis closely shared similar sonographic findings like diffuse lobe enlargement, heterogeneous echotexture, reduced intraparenchymal echogenicity and increase in Doppler flow. These findings made it hard to distinguish the two conditions preciselyby sonography. Thyroid cancer was diagnosed in 7.6% of the patients and this condition sharedmicro calcification and nodular irregularity in sonographic findings

Use of scintigraphy as the gold standard made it possible to differentiate thyroid diseases seen by ultrasound. Multinodular goiter was found to have heterogeneous radiotracer uptake and more increased uptake was seen in toxic multinodular goiter. It was difficult to differentiate sub-acute thyroiditis from silent thyroiditis since both of them showed decreased radiotracer uptake and the only differentiation relies on patient recovery. Graves' disease and Hashimoto thyroiditis both showed an increase in radiotracer uptake. No radiotracer uptake was seen in the patients who had thyroid cancer.

**Conclusions;** In conclusion, the results of this study confirm that thyroid ultrasound and scintigraphy can detect thyroid diseases

The accuracy of diagnosis for thyroid diseases increases when both modalities of diagnosis are used together.

Sonography which is noninvasive imaging procedure that can safely be performed in critically ill patients should be the initial investigation process in patients presenting with thyroid disease and scintigraphy should be used as a complementary tool.

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# CHAPTER ONE

## 1. INTRODUCTION

### 1.1 BACKGROUND

The process of evaluation and management of thyroid masses remain an area of controversy. Thyroid ultrasonography has established itself as a popular and useful tool in the evaluation and management of thyroid disorders yet alone it cannot give fully detailed information for diagnoses and proper management of thyroid diseases(1). Advanced ultrasound techniques in thyroid imaging have not only fascinated the radiologists but also attracted the surgeons and endocrinologists who are using these techniques in their daily clinical and operative practice. The role of thyroid scintigraphy, on the other hand, in the initial evaluation of the thyroid nodule has been questioned by several investigators(2). However, thyroid scanning remains critical for the determination of autonomously functioning thyroid tissue and scintigraphy need not be done routinely main use would be ectopic thyroid tissue (3).

There are minor but potentially significant differences in the handling of these two radiopharmaceuticals by thyroid follicular cells. Normal thyroid follicular cells will trap both technetate and radioiodine(4). Nonetheless, ultrasonography provides considerably more anatomic (but not functional) detail than thyroid scintigraphy or computerized tomography and it has an important role in certain situations. The high-resolution 10 MHz transducers are able to resolve thyroid cysts that measure only 2 mm, and solid lesions as small as 4mm in size(5).

The introduction of high-resolution thyroid ultrasonography provides for an anatomic definition that is clearly superior to thyroid scintigraphy. However, radionuclide imaging of the thyroid remains critical for determining the functional status of abnormal thyroid tissue(5). While aspiration, ultrasound, and scintigraphy all have appropriate indications, utility, and limitations, no single test or group of tests substitutes for careful clinical assessment and follow up. This is because the sonographic features of these processes may be similar but may have a different biochemical profile and clinical presentations(6).

This study aimed to assess the sonographic and radionuclide scintigraphy findings of patients presenting with thyroid mass at Muhimbili National Hospital (MNH).

### Thyroid mass

A thyroid mass (a swelling in the neck) is usually due to an enlargement of the thyroid gland which is also known as goiter. Nodules are lumps in the thyroid gland. These lumps normally present as midline swelling, anterior neck swelling, or lateral lumps if only one lobe is involved. A thyroid nodule may be a lump in an otherwise normal thyroid gland. However, goiters may consist of many nodules (multinodular goiter) and solitary nodules may exist within a goiter. Nodules may be cystic, colloid, hyperplastic, adenomatous or cancerous (7)(8).

### Ultrasound scan

This procedure is painless and uses sound waves from a probe to examine the structure of the thyroid gland. It is highly sensitive for detection and characterization of thyroid nodules and can establish the number and size of nodules in the thyroid and can give important information on the likelihood that a nodule is benign or cancerous. It is far more sensitive than clinical examination and only a small percentage of nodules detected by ultrasound are clinically palpable. The Thyroid gland is also well suited for ultrasound investigation because it is superficial in location, and has good vascularity (9). Thyroid USS has established a useful tool in managing and evaluation of thyroid disease to the extent that it has attracted surgeons, endocrinologists and fascinated radiologist. Indications for USS in thyroid mass include confirmation of the presence and type of thyroid nodules, differentiation of benign from malignant nodules and other cervical masses and detection of post-operational residual or remnant tumor and evaluates diffuse parenchymal disease(10).

## Scintigraphy

Thyroid scintigraphy is a nuclear medicine procedure that produces a visual display of functional thyroid tissue based on the selective uptake of various radionuclides by thyroid tissue. It measures an important step of iodine metabolism of the entire thyroid gland or parts of it. An intravenous

injection of $^{99m}$Tc pertechnetate or $^{123}$I iodide is administered. These are radioactive tracers, which are absorbed by the thyroid glands. Thyroid scintigraphy provides valuable information regarding both thyroid anatomy and physiology. Thyroid scintigraphy allows the direct visualization of the functional adenomatous thyroid tissue responsible for the development of hyperthyroidism. For this reason, thyroid scintigraphy will allow the diagnosis of hyperthyroidism before laboratory tests are consistently abnormal.

**Management of thyroid mass**

Management mainly depends on the specific cause. Thyroid nodules with a benign diagnosis in the initial cytological evaluation have long been thought to require only cervical sonographic assessment for long-term follow-up, regardless of the results of the US examination. Despite a false-negative rate that has been classically established at 5%(11)(12), several authors have demonstrated the value of repeat FNAC studies for certain thyroid nodules with initially benign cytology(13)(14). There is still controversy over what criteria should be used to select such nodules and over whether systematically repeating FNAC studies to minimize the number of false-negative results is justified. In solid-nodule cases (including mixed nodules with solid portions) where the growth is less than 20% of the diameter in two dimensions, the appropriate USS follow-up interval may be as long as every 3 to 5 years(11).

# CHAPTER TWO

## 2.1 PROBLEM STATEMENT

Thyroid disease can be easily mistaken for abnormal lymph nodes enlargement adjacent to the thyroid especially if the nodes are cystic or calcified, This is why the diagnosis of thyroid disease in Africa remains suboptimal(15)In most of our local setting we usually rely on few modalities to diagnose patients presenting with thyroid diseases. In our settings, clinicians can only rely on clinical presentations, physical examination and biochemical findings. They may lack knowledge of the usefulness of thyroid ultrasound and scintigraphy in the evaluation of thyroid masses. Therefore clinicians need knowledge on the use of ultrasonography and scintigraphy in the evaluation of thyroid masses rather their dependence on cytological puncture specimens. A study showed that ultrasound and scintigraphy are reliable methods of diagnosis for selecting patients who have to receive cytological puncture. If scintigraphy shows warm nodules then there is no need for an ultrasound-guided cytological puncture(16) However Scintigraphy, ultrasound and ultrasound-guided biopsy are a complementary method in the reliable diagnosis of nodular disease of the thyroid. Use of ultrasound, scintigraphy with cytological data from Bethesda classification systems of thyroid mass could provide sufficient and reliable features for the diagnosis of thyroid nodules and this will help reduce mistakes on the diagnosis and hence reduce complications and mortality of thyroid disease in providing of proper management(17).

## 2.2 RATIONALE

Thyroid diseases constitute a major public health problem in our setting and contribute significantly to unacceptably high morbidity and mortality(18). Urgent preventive measures targeting at reducing the prevalence, early recognition and early management of thyroid diseases are essential for the optimal patient outcome and will reduce the complications, morbidity, and mortality resulting from these diseases. Emphasis and sensitization of clinicians are needed so that they can request ultrasound and scintigraphy examination. Ultrasound is being recognized as a traditional way of the diagnosis of various thyroid disorder and this will help in detecting thyroid mass in early stage(19). Ultrasound and scintigraphy are very important imaging modalities in the evaluation of thyroid nodules particular neoplasms which are frequently associated with non-

diagnostic cytology(20) Therefore it is very important to conduct this study now because it can add more knowledge and information on the diagnosis of thyroid diseases.

## 2.3 RESEARCH QUESTIONS

1. What are the sonographic and scintigraphy findings in the patients presenting with thyroid disease at Muhimbili National Hospitals and Ocean Road Cancer Institute from November 2018 to April 2019?
2. What is the relationship between Ultrasound and Scintigraphy findings in the patients presenting with thyroid diseases at Muhimbili National Hospitals and Ocean Road Cancer Institute from November 2018 to April 2019?

## 2.4 OBJECTIVES

### 2.4.1 Broad objective.

To determine the sonographic and scintigraphy findings in the patient presenting with thyroid disease at Muhimbili National Hospitals and Ocean Road Cancer Institute from November 2018 to April 2019

### 2.4.2 Specific objectives

1) To establish the social demographic status in patients presenting with thyroid disease at Muhimbili National Hospitals and Ocean Road Cancer Institute from November 2018 to April 2019
2) To determine clinical presentation in patients presenting with thyroid disease at Muhimbili National Hospitals and Ocean Road Cancer Institute from November 2018 to April 2019
3) To determine the sonographic findings inpatients presenting with thyroid disease at Muhimbili National Hospitals and Ocean Road Cancer Institute from November 2018 to April 2019
4) To determine scintigraphy findings in patients presenting with thyroid disease at Muhimbili National Hospitals and Ocean Road Cancer Institute from November 2018 to April 2019
5) To compare sonographic with scintigraphy findings in patients presenting with thyroid disease at Muhimbili National Hospitals and Ocean Road Cancer Institute from November 2018 to April 2019

## 2.5 LITERATURE REVIEW

Studies on thyroid swelling are very common but the data on their respective correlation between clinical, pharmacological and radiological findings are scarce. This is more obvious in African countries including Tanzania due to either poor documentation, fewer medical facilities for diagnosis and management or ineffective health system in storage and keeping of patients' information(21).

Thyroid nodules are one of the most common endocrine diseases in the world. They affect approximately 4 to 7% of the population in iodine-sufficient areas, with a markedly increased incidence in iodine-deficient regions(22).

Most of the world populations live in an area of low iodine supply where the prevalence of goiter is high and the most population at risk are those who live in remote areas and mountains area in South East Asia, Latin America and Central Africa(23)(18)

Incidence and development of nodules correlate directly with the age of the patient and is regarded as a part of the normal maturation process of the thyroid gland(17)(25)(25)

Females appear to be more affected than men with 2.5 – 6 times differences. However severe cases occur more often in men. Most patients are from the age of 30 – 50 years and with severe cases seen beyond the age of 50. (26)(27)(16)(18)(28)(29)(30)

Different studies have shown different clinical presentation of patients presenting with thyroid mass and even sometimes they use this symptom's in predicting benign disease versus malignant.

Patients with thyroid disease may present with features that are attributable to their physiological effect as to whether there is increase or decrease in plasma concentration of thyroid hormone, or localized or generalized enlargement of the gland and these include weight loss, anxiety or nervousness, increase sweating, tremors, diarrhea, palpitations, muscle weakness and heat intolerance while fatigue, weight gain depression, lethargy, dry skin, cold intolerance, voice change, change in menses will represent a decrease in plasma concentration of thyroid hormone. Also generalized neck swelling, neck mass, dysphagia, neck pain or hoarseness of voice will present with the general thyroid enlargement.(31)(32)

A study done by Chandna on the oral manifestation of thyroid disease revealed that the oral cavity may be adversely affected by either excess or inefficient of thyroid hormone(33). Other rare cases of clinical feature which usually are not seen in thyroid disease have been observed in a patient with thyroid diseases(34).In elderly cardiac manifestations like atrial fibrillation is common (35). Other presentation of thyroid disease will include infiltrative ophthalmopathy or pretibial myxedema and these are sufficient to make diagnosis mostly seen in elevated thyroid hormone(36)

Thyroid ultrasound is a very sensitive imaging modality in identifying the suspicious feature and helps to decide whether the nodule requires aspiration or not and the imaging modality of choice for the investigation of thyroid nodules is high-resolution USS.(37)(12). In 2017 article by Unsal O et al on the sonographic scoring of thyroid nodules stated that there is an association between malignant nodules and hypo echogenicity, border irregularity, increase intranodular vascularity and micro calcification(38). Other article showed an association between the benign nodule and sonographic features like no calcification, no increase in vascularity, well-defined margins, and no evidence of lymphadenopathy. These observations have been helpful in avoiding unnecessary FNAB(39)

Micro calcifications, central blood flow, boarders irregularities,hypoechogenicity and nodular size of more than 2cm are ultrasound features which when present in a nodule they are used to predict the presence of malignancy.(40) (41) (42)(43)(44)(45)

Thyroid inflammatory conditions like thyroiditis have variable sonographic appearance including solid hyperechoic nodules with irregular margins, heterogeneity, the presence of a cervical chain of lymph nodes calcifications and cystic regions are also common. Vascularity, as assessed by color and power Doppler, varied widely. Therefore biopsy becomes necessary in differentiating it from other lesions(46)(47)(48)

Due to the use of ultrasound and the availability of ultrasound-guided fine needle aspiration biopsy, the number of small-sized thyroid gland carcinoma has increased(49). Some studies have found a higher malignancy rate in patients with a solitary nodule than in patients with multiple lesions(50). Cervical ultrasound is the method of choice for studying thyroid nodules, It enables the evaluation of the size, location, and characteristics suggestive of malignancies(51)(52)

Thyroid scintigraphy imaging has been an important investigation and assessment of the gland and it has been the most common clinical indication for confirming Graves' disease(53). Thyroid scintigraphy can provide valuable information regarding both anatomy and physiology and can give a diagnosis of hyperthyroidism before laboratory test are known (54)(55)(56).

Low iodine scintigraphy uptake is suggestive of the destructive process .Increase in radiotracer uptake is seen in inflammatory thyroid disease and decrease in radiotracer uptake is seen in malignant thyroid disease.(57)(58)(59)(60)(61)

Many studies have shown that scintigraphy and ultrasound complement each other in making thyroid disease diagnoses as scintigraphy showed greater sensitivity than ultrasound in detections of enlarged thyroid while ultrasound showed higher specificity(1). Ultrasound can be used as a reliable method for selecting patient for cytology and if scintigraphy shows warm nodules there will be no need for doing ultrasound-guided cytological biopsy(16)Ultrasound detects anatomical changes such as size, calcification degeneration, cystic degeneration and lymph node metastasis while scintigraphy studies provide functional changes, ectopic and accessory thyroid and even skeletal metastasis(62). Scintigraphy investigation of thyroid lobes with greater than normal uptake has a different presentation in ultrasound examination including variable homogeneity, echogenicity margination and they are larger in size and therefore was concluded that there is an association between the two(63)

# CHAPTER THREE

## 3.0 METHODOLOGY

### 3.1 STUDY DESIGN

The study was a hospital-based descriptive cross-sectional study and was conducted at Muhimbili National Hospitals and Ocean road Cancer Institute from November 2018 to April 2019.

### 3.2 STUDY POPULATION

All patients or clients who present at Muhimbili National Hospitals and Ocean Road Cancer Institute with thyroid diseases from November 2018 to April 2019 and met inclusion criteria.

### 3.3 STUDY AREA

The study was done at Muhimbili national hospitals and Ocean Road Cancer Institute within the Radiology Department. Muhimbili National Hospitals and Ocean road Cancer Institute are referral teaching hospitals located in Ilala district, Dar es Salaam, Tanzania. MNH and ORCI were chosen because these hospitals receive patients almost from the whole country referred by district, regional, faith-based hospitals, and thyroid clinic done in nuclear medicine section at ORCI.

### 3.4 INCLUSION CRITERIA

All patients who presented at the MNH radiology department and Ocean Road Cancer Institute during the study period and clinically presenting with thyroid disease were included in this study regardless of the age of the patient.

### 3.5 EXCLUSION CRITERIA

Patients with thyroid diseases who had already received treatment were excluded in the study

### 3.6 SAMPLE SIZE ESTIMATION

The sample size of this study was calculated from the formula below;

$$n = \frac{Z^2 \times P(1-P)}{e^2}$$

$$n = \frac{1.96^2 \times 0.04(1-0.04)}{0.05^2}$$

$$n = 59$$

Considering Non-response participants the total sample size was obtained as follows;

(Nx100/100-F) where N=sample size (59), F=non response factor (10%).

The total sample size was[66].

n = the required sample size

Z = the standard normal deviation that corresponds to a 95% level of statistical significance, which is 1.96.

P = is the expected prevalence of thyroid disease, that is 4% according to the study done by MaiaF at al 2012. Thyroid nodules management: Clinical, Ultrasound and cytopathological parameter for predicting malignancy. (17)

E = is the desired precision (margin of error on P) which is set at 5% taking into account the duration of the study.

### 3.7 SAMPLING TECHNIQUE

Non-probability convenience sampling technique was used whereby every patient meeting inclusion criteria was given an equal chance to participate during the study period.

## VARIABLES

### Dependent Variables

- Ultra-sonographic findings of thyroid disease
- Scintigraphy findings of thyroid disease

### Independent Variables are

- Age
- Gender
- Nodules
- Thyroid mass
- Presenting symptoms
- History of surgery, History of medication
- Sonographic Characteristic
- Scintigraphy Characteristic

## 3.8 STUDY TOOLS AND DATA COLLECTION

A detailed history was taken from patients referred from endocrine, causality and emergency department. Patients age, sex, main complain and clinical presentation was recorded.

Those who met inclusion criteria were enrolled in the study after informed consent was obtained first before obtaining a registration number and giving the study number.

Data collection was done through a structured questionnaire. Data collected included socio-demographics, clinical Presentation, sonographic and scintigraphy findings. After obtaining patient social demographic status and history then patients were taken for an ultrasound and scintigraphy examination.

## 3.9 THYROID ULTRASOUND PROCEDURE

Thyroid ultrasound examination was performed by using Philips Machine and GE (Voluson P8) at Mloganzila and at Muhimbili National hospital Siemens Acuson x150 was used with linear frequency transducer of 7-15 MHZ.

Patients were explained how the procedure would be performed and assured that there would be no harm during the procedure.

Then patients were asked to lie on the examination table in a supine position, each patient was turned to either side in order to improve the quality of the image.

A pillow was placed behind the shoulder to extend the area to be scanned for thyroid

Then a warm water-based gel was applied to the area of the thyroid to be studied to make secure contact with the body and eliminate air pockets between transducer and skin.

Linear frequency transducer of 7-15 MHZ was then applied over the area of the extended neck and moved in both ways transverse and longitudinal planes and real-time images were captured for interpretation

Image characterization of mass (location, size, shape, margins, echogenicity, content and vascular pattern) were identified(10). All data and thyroid ultrasound examination done by the principal researcher and results was reviewed by senior Radiologist.

**3.10 SCINTIGRAPHY EXAMINATION PROCEDURE**

After ultrasound examination and imaging interpretation, patients who met the study criteria were referred to Ocean Road Cancer Institute for Scintigraphy investigation which was performed by the nuclear medicine technologist, Patients were required to avoid materials or food that would interfere with radiopharmaceuticals agent's uptake such asanti-thyroid drugs, iodine-based preparation, and contrast media.

Intravenous injection of 99mTC Pertechnetate was given to the patient with an adult dose of 111-185MBq (5mCi) and a pediatric dose of 1,85MBq/kg.

Imagine acquisition; a gamma camera (MEDISO ANY SCAN of 2012 FROMHUNGARY) equipped with a pinhole collimator (7-10cm from the neck) with an aperture of 5mm or less in diameter was used with a patient in a supine position with neck extended and supported by a pillow placed under the shoulders. 15-20 minutes later immediately before imaging patient was given

water to wash away Pertechnetate secreted into saliva and after that image was taken in anterior and anterior oblique position when the target to background ratio was maximum.

The patient was then asked not to swallow or talk during imaging. Then after that image was taken and stored for interpretation(64)

# CHAPTER FOUR

## 4.0 CONCEPTUAL FRAMEWORK

The figure below illustrates the conceptual framework on how sonographic and scintigraphy findings were established in the patient presenting with thyroid disease after being referred for imaging. The ultrasound and scintigraphy diagnostic findings were used to arrive at specific thyroid disease diagnosis among patients presenting with thyroid abnormalities at Muhimbili National Hospitals and Ocean Road Cancer Institute

## 4.1 DATA PROCESSING &ANALYSIS

Data analysis was done by using SPSS version 23. Data quality check was done by running frequency table. Data transformation was preceded using Pearson's Chi-square and Fisher's exact test to compare Sonographic and Scintigraphy findings.

Fisher's exact test was used on cells with values less than 5. P values of 0.05 were considered to indicate a statistically significant difference.

**Null Hypothesis**

This states that there is no different between ultra-sonographic and scintigraphy examinations in patients presenting with thyroid diseases

## 4.2 ETHICAL CLEARANCE

Ethical clearance was obtained from the MUHAS – IRB (institutional review board) and permission to conduct the study. Following approval of this study by the MUHAS Ethical Committees, all participants were clearly informed about the objectives of the study and informed consent was sought.

They were also told that all information gathered will be used for the purpose of the study. In order to maintain confidentiality data will be entered into the computer for analysis and interpretation by using code numbers and patients' initials. No names of participants will be used. Patients were informed that their refusal to participate will not affect their management in any way.

Critically ill patients with an inability to recall past events will still be enrolled in the study and interviewed after recovery or their relatives will be asked to give the missing information.

Permission to use Surgical and endocrinology clinic and Imaging facilities at MNH radiology department was obtained from the Director of Clinical Services Muhimbili National Hospital. Permission for using nuclear medicine section forthyroid scanning obtained from the Director of clinical services at Ocean Road Cancer Institute

**4.3 STUDY LIMITATION, BIAS, AND MITIGATION**:

- To minimize bias all scanning and interpretation were done by the principal researcher and images were reviewed by the senior Radiologist before they were stored into pictures archives and communication system (PACS) or archives.

- An intraob server error was minimized by seeking the second opinion for interpretation of images from senior Radiologists during scanning. Ultrasound diagnostic criteria were used for reference during scanning to minimize intraob server bias.

- Instrument bias: This was minimized by the appropriate setting of the ultrasound frequencies and Time gain curve in order to have a good resolution of the images.

# CHAPTER FIVE

## 5.0 RESULTS.

### 5.1 STUDY POPULATION

During the 6 months of data collection from November 2018 to April 2019 more than 100 patients underwent thyroid diseases examination at Muhimbili national Hospitals. Sixty-six patients were recruited in the study and others were excluded because they did not meet study criteria.

There were more females participants compared to male participants. Female participants were 89.4% and the disease frequencies increase with age with a mean age of 46.98 and13.88 standard deviation.

Table 1: Frequency table showing the distribution of age and sex among study participants

| **Variables** | | **Frequencies** | **Percentage** |
|---|---|---|---|
| **Sex** | **Male** | 7 | 10.6 |
| | **Female** | **59** | **89.4** |
| **Age Group (Years)** | | | |
| | 10-20 | 1 | 1.5 |
| | 21-30 | 10 | 15.2 |
| | 31-40 | 12 | 18.2 |
| | 41-50 | 15 | 22.7 |
| | 51-60 | 20 | 30.3 |
| | 61+ | 8 | 12.12 |

## 5.2 CLINICAL PRESENTATION OF THE STUDY PARTICIPANT

Majority of patient examined (69.7%) for thyroid diseases presented with nodular neck swelling and very few of them presented with the awareness of heartbeat, Proptosis and increase in appetite.

Table 2. Frequency table showing the distribution of clinical presentation among study Participant

| Clinical Presentation | Frequency | Percentage (%) |
|---|---|---|
| Diffuse neck swelling | 21 | 31.8 |
| Nodular neck swelling | 46 | 69.7 |
| Dysphagia | 5 | 7.6 |
| Neck Pain | 6 | 9.1 |
| Hoarseness of voice | 6 | 9.1 |
| Others (heartbeat awareness, Proptosis, and increase food appetite | 2 | 3 |

**ULTRASONOGRAPHIC FINDINGS IN PATIENTS PRESENTED WITH THYROID DISEASE.**

Different sonographic findings among study participant were found, Heterogeneous echotexture and multinodular goiter were the most common sonographic findings (57.6% and 56.9 % respectively).

Other common sonographic features are Hypoechogenicity parenchymal (33.8%), Homogenous echo texture (40.0%) and Increased intraparenchymal color flow (22.7%)

A least sonographic feature found in the patient with thyroid disease were Micro calcification, irregularity, enlarged lymph node, and nodular cystic component.

Table 3. Frequency table showing the distribution of Ultra-sonographic findings among study participants

| | **Ultra-sonographic findings** | |
|---|---|---|
| Variables | Frequency (n) | Percentage (%) |
| Micro-calcification | 10 | 15.2 |
| Micro-calcification | 3 | 4.6 |
| Coarse calcification | 2 | 3.1 |
| Hypoechoic Parenchymal | 22 | 33.8 |
| Iso-echoic Parenchymal | 3 | 4.6 |
| Hyperechoic Parenchymal | 5 | 7.7 |
| Cystic component | 8 | 12.3 |
| Homogenous echotexture | 26 | 40.0 |
| Heterogeneous echotexture | 38 | 57.6 |
| Increased color flow | 15 | 22.7 |
| Decreased color flow | 3 | 4.5 |
| Multinodular | 37 | 56.9 |
| Increased echogenicity | 8 | 12.3 |
| Decreased Echogenicity | 18 | 27.7 |
| Increased vascular flow | 8 | 12.3 |
| Regular margin | 54 | 83.1 |
| Irregular Margin | 8 | 12.3 |

## COMBINED ULTRASONOGRAPHIC FINDINGS INTO RESPECTIVE DIAGNOSIS

Multinodular goiter was among the commonest thyroid disease diagnosed by sonography within the study period. Out of 66 participants, 40 patient which is equal to 60.6% had a multinodular disease.

Benign Solitary nodules and Thyroid malignancy were the least Thyroid disease to be diagnosed by Ultrasound however is difficult to draw conclusion without histology support

Table 4.Frequency table Shows distribution of Thyroid disease by ultrasound

| Thyroid Disease by ultrasound | Frequency | Percentage |
|---|---|---|
| Graves' Disease | 6 | 9.1 |
| Thyroiditis | 11 | 16.7 |
| Multinodular goiter | **40** | **60.6** |
| Benin Solitary nodule | **4** | **6.1** |
| Thyroid Malignancy | **5** | **7.6** |

## DISTRIBUTION OF SCINTIGRAPHY FINDINGS AMONG STUDY PARTICIPANT

Out of 66 study participant, 56 patient only were able to turn for Scintigraphy examination due to various reasons.

Among those patients who did scintigraphy most of them had decreased tracer uptake with a frequency of 32which is equivalent to 57.1% of study participant followed with those who had increased tracer uptake which is equivalent to 35.7%.The least were those who had Heterogeneous tracer uptake.

Table 5. The frequency table shows the distribution of Scintigraphy findings among study Participant

| Findings | frequency | Percentage (%) |
|---|---|---|
| Decreased Tracer Uptake | 31 | 55 |
| Heterogeneous tracer uptake | 4 | 7.1 |
| Increased tracer Uptake | 21 | 37.5 |

## COMPARISON BETWEEN SONOGRAPHIC AND SCINTIGRAPHIC FINDINGS

By Using Cross tabulation and Chi-square test, Sonographic findings were compared with Scintigraphy findings and the test was statistically significant with a p-value of 0.004

Table 6 Comparison of ultrasound disease findings with scintigraphy (P value. 0.004)

| | Scintigraphy | | | |
|---|---|---|---|---|
| **Ultrasound(Thyroid) Disease by ultrasound** | **Cold (%)** | **Cold and Hot (%)** | **Hot (%)** | **Total** |
| Graves | 1 (16.7) | 0 (0) | 5(83.3) | 6 (100) |
| Thyroiditis | 3(27.3) | 0(0) | 8(72.7) | 11 (100) |
| Multinodular Goiter | 26(72.2) | 4(11.1) | 6(16.7) | 36 (100) |
| Thyroid malignancy | 2(66.7) | 0 (0) | 1 (33.3) | 3 (100) |
| Total | 31(55.4) | 4 (7.1) | 21 (37.5) | 56 (100) |

## 5. 3 DISCUSSION

Thyroid disease is common, affecting a large number of people in different age group and sex. In this study, we found out that thyroid disease is more common in females than in males. Out of 66 study participant investigated 59 patient were females which is equal to 89.4% and males were only 7 which is 10.6%. We had also seen that the incidence in developing thyroid disease is increasing with age. In this study, the mean age was 46.98 years old. Other investigators from other countries have shown a similar trend that females are more commonly affected with thyroid diseases than males and the diseases is increasing with age increase(65) (66) (67).

In a study done in Tanzania by Sakafu on thyroid cancer and iodine deficiency status, it was shown that similar age and sex distribution in patients affected by thyroid diseases were the mean age was 47 years of age (29) (68). Changes in thyroid hormone secretion, metabolism and action occurs with an increase in age and aging has been associated with a decrease in serum thyroid-stimulating hormone and T3 levels and this is why incidence in developing thyroid disease has been shown to increase with age (69)

These data as to why females are more affected than men remains uncertain. There are no studies that have been done to explain this phenomenon. However, the observation may be associated with female hormones. The high estrogen levels in females may be associated with the sexual disparity observed. (65)

The most common clinical presentation of a patient presenting with thyroid disease in our study was neck swelling (nodular)and diffuse by 69.7% and 31.8% respectively followed by neck pain, hoarseness of voice, heartbeat awareness and increase in appetite. This is true in very few studies which suggested that swelling of the neck as the most common clinical presentation (70)

Most studies especially those conducted outside Africa disagree with our findings that swelling of the neck is the most common clinical presentation. Those studies point out that presentation like anxiety, nervousness, increase in palpitation and heat intolerance are the most common clinical presentation (71) (72). This is because, in our settings especially in African countries, individuals commonly see a doctor only when they are very sick. Anxiety and nervousness are usually ignored. In African settings, many people come from the peripheral area where health service is poor.

Therefore this may explain why in our country swollen neck has been the most common presentation of the disease of the thyroid.

Multinodular goiter was the most common sonographic disease diagnosed in the patient presented with thyroid abnormalities by 60.6 %.The least sonographic diagnosis was for benign solitary nodules and patients suspected by ultrasound to have thyroid malignancy was 6.1% and 7.6% respectively. Sonographic findings of Multinodular goiter by ultrasound was found to be enlarged thyroid gland with multiple iso or hypoechoic nodules. Many investigators have similar findings that multinodular goiter is the commonest thyroid disease and ultrasound can easily find nodules (69) (73) (74). Chaudhary at el suggested that 50% to 70% is the prevalence of the multinodular disease by ultrasound which is also similar to our result(75).

Thyroiditis and Graves' disease were seen by 16.7% and 9.1% respectively by ultrasound and shared many sonographic findings in common like diffuse lobes enlargement, heterogeneous echotexture, reduced echogenicity and increased intraparenchymal color flow. Therefore these sonographic findings are consistent with other studies but it was found difficult to differentiate them by ultrasound(76) (77). 7.6% of patients diagnosed to have thyroid malignancy had presented mostly with micro calcification and nodules irregularities. This observation was similar to other studies which showed that microcalcification, nodal irregularity, and increase dintranodal vascularity were the common sonographic feature in thyroid malignancy and the prevalence is less than 7%.(78) (77).

Thyroid Scintigraphy provides valuable information regarding thyroid function and anatomy. In this study, it was observed that patient who had decreased tracer uptake were 57.1 %.This is because most of the patients who attended had Multinodular goiter as compared to Graves' disease and thyroiditis and most of the Multinodular goiter present with a decrease in tracer uptake and Heterogeneous tracer uptake(56). In toxic multinodular goiter patient presented with irregular areas of diminished and increase in tracer uptake. Therefore it was found that these findings are similar to other different studies done to determine scintigraphy findings in thyroid disease(56)(79)(80). Patient with Graves' disease had diffusely enlarged gland and a generalized increase in tracer uptake (hot nodules). Among thyroiditis patient suspected by ultrasound, 27.3%had sub-acute thyroiditis by scintigraphy whereby there was a decrease in tracer uptake (cold nodules) as compared to Hashimoto thyroiditis (72.7%) which represent a wide range of

thyroid disease with increase in tracer uptake.(81). Intenzo et al had suggested a very similar description of Graves and thyroiditis findings. However, it is difficult by imaging to differentiate sub-acute thyroiditis and silent thyroiditis since they both yield similar decrease in radiotracer uptake by scintigraphy. Therefore differentiation can only be made by waiting for a patient recovering from silent thyroiditis to show improved symptoms and thyroid function test will return to normal.(56)

Therefore in this study, it was found that the use of both sonography and scintigraphy can both make a diagnosis of thyroid disease. However, the two tests are significantly differenced with a P value of 0.004. By considering a patient who was diagnosed to have Graves ' disease by sonography its only 83.3% had truly graves' disease for scintigraphy and sonography could not differentiate the different types of thyroiditis while scintigraphy could differentiate.E.g. Out of 11 patient who had thyroiditis 72.7% had Hashimoto thyroiditis and 27.3% had either subacute or silent thyroiditis. In cases' of Multinodular goiter seen by Sonography, 16.7% had toxic multinodular goiter. Similar studies have shown that these two imaging modalities are complementary to each other and when used together they increase the accuracy for the diagnosis of thyroid diseases.(16)

## 5.4 STUDY LIMITATION

The study did not involve confirmatory test when making comparisons, following these findings it was considered that scintigraphy is the gold standard. When comparing two tests there should be a confirmatory test to refer to. In this study, either thyroid function test or Fine needle aspiration cytology could help.

In General a hospital-based study not generalizable to a community setting.

Larger sample size could not be obtained because in the middle of data collection Gamma camera machine was out of order so no thyroid scanning was performed and hence some of the patient who lived far from Dar es Salaam could not wait.

## 5.5 CONCLUSION

In this study, females are commonly affected with thyroid disease as compared with males. Out of 66 participants attended 59 were females which is equal to 89.4%. Disease prevalence was seen to increase as the age increases up to the age of 60 with the mean age of 46.98 and SD of 13.88

The most common clinical presentation in the patient presented with thyroid diseases was neck swelling (Diffuse and Nodular).Other clinical presentation like dysphagia, Neck swelling, Hoarseness of voice. Awareness of heartbeat and Proptosis were seen but not as much as neck swelling.

The most common thyroid disease diagnosed by sonography was multinodular goiter with 60.6% which had enlarged thyroid lobes and multiply more than two nodules as the common sonographic findings. Graves' disease and Thyroiditis closely shared similar sonographic findings like diffuse lobe enlargement, heterogeneous echotexture, reduced intraparenchymal echogenicity and increase in Doppler flow thus become difficult to differentiate the two disease by sonography. Others which is 7.6% were diagnosed to have thyroid cancer shared Micro calcification and nodular irregularity as commonest sonographic findings.

Scintigraphy as the gold standard was able to differentiate most of the thyroid disease seen by ultrasound. Multinodular goiter was found to have heterogeneous radiotracer uptake and more increased in uptake were seen in Toxic multinodular goiter. It was difficult to differentiate sub-acute thyroiditis and silent thyroiditis since both of them showed decreased in radiotracer uptake and the only differentiation relies on patient recovery. Graves’ disease and Hashimoto thyroiditis both showed an increase in radiotracer uptake. No uptake was seen in the patient who had thyroid cancer.

## 5.6 RECOMMENDATION

Mass thyroid screening should be conducted by using ultrasound as the initial investigation followed by scintigraphy for confirmation.

More studies involving a larger sample size should be conducted.

Ultrasound and scintigraphy should be used in the evaluation of thyroid disease as when used concurrently accuracy of the diagnosis increase.

**REFERENCES**


1. Kobylecka M, Płazińska MT, Chudziński W, Fronczewska-Wieniawska K, Mączewska J, Bajera A, et al. Comparison of scintigraphy and ultrasound imaging in patients with primary, secondary and tertiary hyperparathyroidism - own experience. J Ultrason [Internet]. 2017 Mar [cited 2018 Jun 2];17(68):17–22. Available from: http://www.ncbi.nlm.nih.gov/pubmed/28439424
2. VAN HERLE AJ, RICH P, LJUNG B-ME, ASHCRAFT MW, SOLOMON DH, KEELER EB. The Thyroid Nodule. Ann Intern Med [Internet]. 1982 Feb 1 [cited 2018 Apr 11];96(2):221. Available from: http://annals.org/article.aspx?doi=10.7326/0003-4819-96-2-221
3. Rojeski MT, Gharib H. Nodular Thyroid Disease. N Engl J Med [Internet]. 1985 Aug 15 [cited 2018 Apr 11];313(7):428–36. Available from: http://www.nejm.org/doi/abs/10.1056/NEJM198508153130707
4. Maia FFR, Matos PS, Silva BP, Pallone AT, Pavin EJ, Vassallo J, et al. Role of ultrasound, clinical and scintigraphyc parameters to predict malignancy in thyroid nodule. Head Neck Oncol [Internet]. 2011 Mar 22 [cited 2018 Apr 11];3:17. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21426548
5. Sisson JC. Medical treatment of benign and malignant thyroid tumors. Endocrinol Metab Clin North Am [Internet]. 1989 Jun [cited 2018 Apr 11];18(2):359–87. Available from: http://www.ncbi.nlm.nih.gov/pubmed/2663479
6. Scheible W, Leopold GR, Woo VL, Gosink BB. High-Resolution Real-Time Ultrasonography of Thyroid Nodules. Radiology [Internet]. 1979 Nov [cited 2018 Apr 11];133(2):413–7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/582856
7. Turkington JRA, Paterson A, Sweeney LE, Thornbury GD. Neck masses in children. Br J Radiol [Internet]. 2005 Jan [cited 2018 Apr 11];78(925):75–85. Available from: http://www.ncbi.nlm.nih.gov/pubmed/15673538
8. Gupta A, Ly S, Castroneves LA, Frates MC, Benson CB, Feldman HA, et al. A Standardized Assessment of Thyroid Nodules in Children Confirms Higher Cancer Prevalence Than in Adults. J Clin Endocrinol Metab [Internet]. 2013 Aug [cited 2018 Apr 11];98(8):3238–45. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23737541
9. Levine RA. History of Thyroid Ultrasound. In: Thyroid Ultrasound and Ultrasound-Guided FNA [Internet]. Boston, MA: Springer US; 2008 [cited 2018 May 28]. p. 1–8.

Available from: http://link.springer.com/10.1007/978-0-387-77634-7_1

10. Chaudhary V, Bano S. Thyroid ultrasound. Indian J Endocrinol Metab [Internet]. 2013 Mar [cited 2018 May 28];17(2):219–27. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23776892
11. Eng CY, Quraishi MS, Bradley PJ. Management of Thyroid nodules in adult patients. [cited 2018 Apr 11]; Available from: http://www.headandneckoncology.org/content/2/1/11
12. Frates MC, Benson CB, Charboneau JW, Cibas ES, Clark OH, Coleman BG, et al. Management of Thyroid Nodules Detected at US: Society of Radiologists in Ultrasound Consensus Conference Statement. Radiology [Internet]. 2005 Dec [cited 2018 Apr 11];237(3):794–800. Available from: http://www.ncbi.nlm.nih.gov/pubmed/16304103
13. Kwak JY, Kim E-K, Kim HJ, Kim MJ, Son EJ, Moon HJ. How to combine ultrasound and cytological information in decision making about thyroid nodules. Eur Radiol [Internet]. 2009 Aug 11 [cited 2018 Apr 11];19(8):1923–31. Available from: http://www.ncbi.nlm.nih.gov/pubmed/19277669
14. Flanagan MB, Ohori NP, Carty SE, Hunt JL. Repeat thyroid nodule fine-needle aspiration in patients with initial benign cytologic results. Am J Clin Pathol. 2006;
15. Ogbera AO, Kuku SF. Epidemiology of thyroid diseases in Africa. Indian J Endocrinol Metab [Internet]. 2011 Jul [cited 2018 May 28];15(Suppl 2):S82-8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21966659
16. Sehovic S, Begic A, Juric N, Celam M. Comparison between ultrasound, scintigraphy and cytological puncture in diagnostics of thyroid gland nodules. Med Arch (Sarajevo, Bosnia Herzegovina) [Internet]. 2013 [cited 2018 Jun 2];67(3):198–201. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23848043
17. Maia FFR, Zantut-Wittmann DE. Thyroid nodule management: clinical, ultrasound and cytopathological parameters for predicting malignancy. Clinics (Sao Paulo) [Internet]. 2012 Aug [cited 2018 Jun 19];67(8):945–54. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22948464
18. Wachter ' W, Mvungi M, Konig A, Pickardt CR, Scriba4 PC. Prevalence of goitre and hypothyroidism in Southern Tanzania: effect of iodised oil on thyroid hormone deficiency*. J Epidemiol Community Health [Internet]. 1986 [cited 2018 Jun 19];40:86–91. Available from: http://jech.bmj.com/content/jech/40/1/86.full.pdf

19. Saeed MI, Hassan AA, Butt ME, Baniyaseen KA, Siddiqui MI, Bogari NM, et al. Pattern of Thyroid Lesions in Western Region of Saudi Arabia: A Retrospective Analysis and Literature Review. J Clin Med Res [Internet]. 2018 Feb [cited 2018 May 28];10(2):106–16. Available from: http://www.ncbi.nlm.nih.gov/pubmed/29317955
20. Radiological Society of South Africa. A, Gutta AA, Graaf K de, Mdaka T. SA journal of radiology. [Internet]. Vol. 21, South African Journal of Radiology. Cannon Communications; 2017 [cited 2018 Jun 2]. 7 p. Available from: https://sajr.org.za/index.php/sajr/article/view/1099/1355
21. Lange TA, Austin CW, Seibert JJ, Angtuaco TL, Yandow DR. Ultrasound imaging as a screening study for malignant soft-tissue tumors. J Bone Joint Surg Am [Internet]. 1987 Jan [cited 2018 Apr 11];69(1):100–5. Available from: http://www.ncbi.nlm.nih.gov/pubmed/3543017
22. Popoveniuc G, Jonklaas J. Thyroid nodules. Med Clin North Am [Internet]. 2012 Mar [cited 2018 May 26];96(2):329–49. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22443979
23. Vanderpump MPJ. The epidemiology of thyroid disease. Br Med Bull [Internet]. 2011 Sep 1 [cited 2018 Jul 14];99(1):39–51. Available from: https://academic.oup.com/bmb/article-lookup/doi/10.1093/bmb/ldr030
24. Hoang JK, Lee WK, Lee M, Johnson D, Farrell S. US Features of Thyroid Malignancy: Pearls and Pitfalls. RadioGraphics [Internet]. 2007 May [cited 2018 Apr 11];27(3):847–60. Available from: http://www.ncbi.nlm.nih.gov/pubmed/17495296
25. Ezzat S, Sarti DA, Cain DR, Braunstein GD. Thyroid incidentalomas. Prevalence by palpation and ultrasonography. Arch Intern Med [Internet]. 1994 Aug 22 [cited 2018 Apr 11];154(16):1838–40. Available from: http://www.ncbi.nlm.nih.gov/pubmed/8053752
26. Ackuaku-Dogbe EM, Akpalu J, Abaidoo B. Epidemiology and Clinical Features of Thyroid-associated Orbitopathy in Accra. Middle East Afr J Ophthalmol [Internet]. 2017 [cited 2018 Jul 14];24(4):183–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/29422752
27. Masereka R, Okeny PK, Fualal JO, Wamala D. Diagnostic accuracy of fine needle aspiration cytology in patients undergoing thyroidectomy in Uganda: tertiary hospital experience. Afri Heal Sci [Internet]. 2016 [cited 2018 Apr 12];16(4):1143–50. Available from: http://dx.doi.org/10.4314/ahs.v16i4.32

28. Sakafu LL, Mselle TF, Mwaiselage JD, Maunda KK, Eddin BS, Zafereo ME. Thyroid Cancer and Iodine Deficiency Status: A 10-Year Review at a Single Cancer Center in Tanzania. OTO Open [Internet]. 2018 Apr 22 [cited 2018 Jun 18];2(2):2473974X1877723. Available from: http://journals.sagepub.com/doi/10.1177/2473974X18777238
29. Chalya PL, Rambau P, Mabula JB, Kanumba ES, Giiti G, Chandika AB, et al. Patterns and outcome of surgical management of goitres at Bugando Medical Centre in northwestern Tanzania. Tanzan J Health Res [Internet]. 2011 [cited 2018 Jun 18];13(3). Available from: http://www.bioline.org.br/pdf?th11029
30. K DR, K SA, Gautam N. Prevalence and impact of thyroid disorders based on TSH level among patients visiting tertiary care hospital of South Western Nepal. [cited 2018 Jun 18]; Available from: https://pdfs.semanticscholar.org/4cad/9d1e85241fa4ad344b11c17f4f1e9cdeaeff.pdf
31. Melish JS. Thyroid Disease [Internet]. Clinical Methods: The History, Physical, and Laboratory Examinations. Butterworths; 1990 [cited 2018 Jul 14]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21250085
32. Biondi B, Palmieri EA, Klain M, Schlumberger M, Filetti S, Lombardi G. Subclinical hyperthyroidism: clinical features and treatment options. Eur J Endocrinol [Internet]. 2005 Jan 1 [cited 2018 Jul 14];152(1):1–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/15762182
33. Chandna S, Bathla M. Oral manifestations of thyroid disorders and its management. Indian J Endocrinol Metab [Internet]. 2011 Jul [cited 2018 Jul 14];15(Suppl 2):S113-6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21966646
34. El-Shafie KT. Clinical presentation of hypothyroidism. J Family Community Med [Internet]. 2003 Jan [cited 2018 Jul 14];10(1):55–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23011981
35. Goichot B, Caron P, Landron F, Bouée S. Clinical presentation of hyperthyroidism in a large representative sample of outpatients in France: relationships with age, aetiology and hormonal parameters. Clin Endocrinol (Oxf) [Internet]. 2016 Mar [cited 2018 Jul 14];84(3):445–51. Available from: http://www.ncbi.nlm.nih.gov/pubmed/25959282
36. Spaulding SW, Lippes H. Hyperthyroidism. Causes, clinical features, and diagnosis. Med Clin North Am [Internet]. 1985 Sep [cited 2018 Jul 14];69(5):937–51. Available from:

http://www.ncbi.nlm.nih.gov/pubmed/3932794

37. Xie C, Cox P, Taylor N, LaPorte S. Ultrasonography of thyroid nodules: a pictorial review. Insights Imaging [Internet]. 2016 Feb [cited 2018 Jul 15];7(1):77–86. Available from: http://www.ncbi.nlm.nih.gov/pubmed/26611469
38. Unsal O, Akpinar M, Turk B, Ucak I, Ozel A, Kayaoglu S, et al. Sonographic scoring of solid thyroid nodules: effects of nodule size and suspicious cervical lymph node. Braz J Otorhinolaryngol [Internet]. 2017 Jan [cited 2018 Jul 15];83(1):73–9. Available from: http://linkinghub.elsevier.com/retrieve/pii/S1808869416300313
39. Tay S-Y, Chen C-Y, Chan WP. Sonographic criteria predictive of benign thyroid nodules useful in avoiding unnecessary ultrasound-guided fine needle aspiration. J Formos Med Assoc [Internet]. 2015 Jul 1 [cited 2018 Jul 15];114(7):590–7. Available from: https://www.sciencedirect.com/science/article/pii/S0929664614001090
40. Maia FFR, Matos PS, Silva BP, Pallone AT, Pavin EJ, Vassallo J, et al. Role of ultrasound, clinical and scintigraphyc parameters to predict malignancy in thyroid nodule. Head Neck Oncol [Internet]. 2011 Mar 22 [cited 2018 Apr 2];3:17. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21426548
41. Davies L, Welch HG. Increasing Incidence of Thyroid Cancer in the United States, 1973-2002. JAMA [Internet]. 2006 May 10 [cited 2018 Apr 11];295(18):2164. Available from: http://jama.jamanetwork.com/article.aspx?doi=10.1001/jama.295.18.2164
42. Li Q, Chen S, Xiong H, Xu X, Li Z, Guo G. Papillary thyroid carcinoma on sonography. Clin Imaging [Internet]. 2010 Mar 1 [cited 2018 Apr 11];34(2):121–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20189076
43. González-González A, Mate Valdezate A, Parra Arroyo A, Tenías Burillo JM. [Diagnostic efficiency of sonographic findings of thyroid nodules in the detection of malignancy]. Endocrinol Nutr [Internet]. 2010 [cited 2018 Apr 11];57(6):240–4. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20447882
44. Moon HJ, Kwak JY, Kim MJ, Son EJ, Kim E-K. Can Vascularity at Power Doppler US Help Predict Thyroid Malignancy? Radiology [Internet]. 2010 Apr 10 [cited 2018 Apr 11];255(1):260–9. Available from: http://pubs.rsna.org/doi/10.1148/radiol.09091284
45. Cantisani V, Catania A, De Antoni E, Greco R, Caruso R, Di Segni M, et al. Is pattern III as evidenced by US color-Doppler useful in predicting thyroid nodule malignancy? Large-scale retrospective analysis. Clin Ter [Internet]. 2010 [cited 2018 Apr 11];161(2):e49-52.

Available from: http://www.ncbi.nlm.nih.gov/pubmed/20499019

46. Yamashiro I, Saito O de C, Chammas MC, Cerri GG. Achados ultra-sonográficos na tireoidite. Radiol Bras [Internet]. 2007 Apr [cited 2018 Aug 2];40(2):75–9. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0100-39842007000200003&lng=pt&tlng=pt

47. Oppenheimer DC, Giampoli E, Montoya S, Patel S, Dogra V. Sonographic Features of Nodular Hashimoto Thyroiditis. Ultrasound Q [Internet]. 2016 Sep [cited 2018 Aug 2];32(3):271–6. Available from: http://content.wkhealth.com/linkback/openurl?sid=WKPTLP:landingpage&an=00013644-201609000-00008

48. Langer JE, Khan A, Nisenbaum HL, Baloch ZW, Horii SC, Coleman BG, et al. Sonographic Appearance of Focal Thyroiditis. Am J Roentgenol [Internet]. 2001 Mar 23 [cited 2018 Aug 2];176(3):751–4. Available from: http://www.ajronline.org/doi/10.2214/ajr.176.3.1760751

49. Brito A dos S, Coeli CM, Barbosa F dos S, Caetano R, Santos M de O, Vaisman M. Estimates of thyroid cancer incidence in Brazil: an approach using polynomial models. Cad Saude Publica [Internet]. 2011 Jul [cited 2018 Apr 11];27(7):1441–4. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-311X2011000700019&lng=en&tlng=en

50. Okayasu I, Fujiwara M, Hara Y, Tanaka Y, Rose NR. Association of chronic lymphocytic thyroiditis and thyroid papillary carcinoma. A study of surgical cases among Japanese, and white and African Americans. Cancer [Internet]. 1995 Dec 1 [cited 2018 Apr 11];76(11):2312–8. Available from: http://doi.wiley.com/10.1002/1097-0142%2819951201%2976%3A11%3C2312%3A%3AAID-CNCR2820761120%3E3.0.CO%3B2-H

51. Cooper DS, Doherty GM, Haugen BR, Kloos RT, Lee SL, Mandel SJ, et al. Revised American Thyroid Association Management Guidelines for Patients with Thyroid Nodules and Differentiated Thyroid Cancer. THYROID [Internet]. 2009 [cited 2018 Apr 11];19(11). Available from: www.liebertpub.com

52. R Maia FF, Engelbrecht Zantut-Wittmann D. Thyroid nodule management: clinical, ultrasound and cytopathological parameters for predicting malignancy. [cited 2018 Apr 11]; Available from: http://www.scielo.br/pdf/clin/v67n8/a15v67n8.pdf

53. Hani Baragwanath C. Central Bringing Excellence in Open Access □ □ JSM Thyroid Disorders and Management Patterns of Indications and Findings of Radionuclide Thyroid Scintigraphy: The. 2017 [cited 2018 Jul 15]; Available from: https://www.jscimedcentral.com/ThyroidDisorders/thyroiddisorders-2-1012.pdf
54. Broome MR. Thyroid Scintigraphy in Hyperthyroidism. Clin Tech Small Anim Pract [Internet]. 2006 Feb 1 [cited 2018 Jul 15];21(1):10–6. Available from: https://www.sciencedirect.com/science/article/pii/S1096286705000782
55. Eng CY, Quraishi MS, Bradley PJ. Management of Thyroid nodules in adult patients. Head Neck Oncol [Internet]. 2010 May 5 [cited 2018 Jun 19];2:11. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20444279
56. Intenzo CM, dePapp AE, Jabbour S, Miller JL, Kim SM, Capuzzi DM. Scintigraphic Manifestations of Thyrotoxicosis. RadioGraphics [Internet]. 2003 Jul 1 [cited 2018 Jun 2];23(4):857–69. Available from: http://pubs.rsna.org/doi/10.1148/rg.234025716
57. Sarkar SD. Benign Thyroid Disease: What Is the Role of Nuclear Medicine? Semin Nucl Med [Internet]. 2006 Jul 1 [cited 2018 Aug 2];36(3):185–93. Available from: https://www.sciencedirect.com/science/article/pii/S0001299806000201
58. Czepczynski. nuclea medicine in the diagnosis of benign thyroid disease. [cited 2018 Aug 2]; Available from: file:///C:/Users/acer/Downloads/19585-24474-1-SM.pdf
59. Oommen R, Walter NM, Tulasi NR. Acta Radiologica Scintigraphic diagnosis of thyroid cancer. 2010 [cited 2018 Aug 2]; Available from: http://www.tandfonline.com/action/journalInformation?journalCode=iard20
60. Harvey AM, Hibbert A, Barrett EL, Day MJ, Quiggin A V., Brannan RM, et al. Scintigraphic findings in 120 hyperthyroid cats. J Feline Med Surg [Internet]. 2009 Feb 1 [cited 2018 Jul 15];11(2):96–106. Available from: https://www.sciencedirect.com/science/article/pii/S1098612X08001307
61. Yarman S, Mudun A, Alagol F, Tanakol R, Azizlerli H, Oguz H, et al. Scintigraphic varieties in Hashimoto's thyroiditis and comparison with ultrasonography. Nucl Med Commun [Internet]. 1997 Oct [cited 2018 Jul 15];18(10):951–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/9392797
62. Anju Devi Loukham Assistant Professor A. Comparative Study of Ultrasound Findings with Nuclear Medicine Scan Findings and Clinical Correlation with Pathological Findings. [cited 2018 Jun 19]; Available from: http://jmscr.igmpublication.org/v3-i11/34

jmscr.pdf

63. Wisner ER, Theon AP, Vet M, Nyland TG, Hornof WJ. ULTRASONOGRAPHIC EXAMINATION OF THE THYROID GLAND OF HYPERTHYROID CATS: COMPARISON TO 99mTcO-4 SCINTIGRAPHY. Vet Radiol <html_ent glyph="@amp;" ascii="&"/> Ultrasound [Internet]. 1994 Jan [cited 2018 Jul 15];35(1):53–8. Available from: http://doi.wiley.com/10.1111/j.1740-8261.1994.tb00178.x
64. Chapman S, Nakielny R. A Guide To Radiological Procedures 4th Edn. [cited 2018 Apr 13]; Available from: http://srt2007feb.weebly.com/uploads/1/3/8/3/13838780/radiological_procedures_4edn.pdf
65. jill grunewald. Why Do Thyroid Disorders Affect Women More Often Than Men? - Experience Life. 2017 [cited 2019 May 16]; Available from: https://experiencelife.com/article/why-do-thyroid-disorders-affect-women-more-often-than-men/
66. Meng Z, Liu M, Zhang Q, Liu L, Song K, Tan J, et al. Gender and Age Impacts on the Association Between Thyroid Function and Metabolic Syndrome in Chinese. Medicine (Baltimore) [Internet]. 2015 Dec [cited 2019 May 16];94(50):e2193. Available from: http://www.ncbi.nlm.nih.gov/pubmed/26683929
67. Sidibé EH. [Thyroid diseases in sub-Saharan Africa]. Sante [Internet]. [cited 2019 May 16];17(1):33–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/17897900
68. Sakafu LL, Mselle TF, Mwaiselage JD, Maunda KK, Eddin BS, Zafereo ME. Thyroid Cancer and Iodine Deficiency Status: A 10-Year Review at a Single Cancer Center in Tanzania. OTO open [Internet]. 2018 [cited 2019 May 16];2(2):2473974X18777238. Available from: http://www.ncbi.nlm.nih.gov/pubmed/30480218
69. Mitrou P, Raptis SA, Dimitriadis G. Thyroid disease in older people. Maturitas [Internet]. 2011 Sep [cited 2019 Jun 13];70(1):5–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21719219
70. Vanderpump MPJ. The epidemiology of thyroid disease. Br Med Bull [Internet]. 2011 Sep 1 [cited 2019 May 16];99(1):39–51. Available from: https://academic.oup.com/bmb/article-lookup/doi/10.1093/bmb/ldr030
71. Ross DS, Burch HB, Cooper DS, Greenlee MC, Laurberg P, Maia AL, et al. 2016

American Thyroid Association Guidelines for Diagnosis and Management of Hyperthyroidism and Other Causes of Thyrotoxicosis. Thyroid [Internet]. 2016 Oct [cited 2019 May 16];26(10):1343–421. Available from: https://www.liebertpub.com/doi/10.1089/thy.2016.0229

72. Alexander EK, Pearce EN, Brent GA, Brown RS, Chen H, Dosiou C, et al. 2017 Guidelines of the American Thyroid Association for the Diagnosis and Management of Thyroid Disease During Pregnancy and the Postpartum. Thyroid [Internet]. 2017 Mar [cited 2019 May 16];27(3):315–89. Available from: https://www.liebertpub.com/doi/10.1089/thy.2016.0457
73. Andreucci M, Solomon R, Tasanarong A. Side Effects of Radiographic Contrast Media: Pathogenesis, Risk Factors, and Prevention. Biomed Res Int [Internet]. 2014 [cited 2019 Jun 13];2014:1–20. Available from: http://www.hindawi.com/journals/bmri/2014/741018/
74. Bahn RS, Castro MR. Approach to the Patient with Nontoxic Multinodular Goiter. J Clin Endocrinol Metab [Internet]. 2011 May [cited 2019 Jun 13];96(5):1202–12. Available from: https://academic.oup.com/jcem/article-lookup/doi/10.1210/jc.2010-2583
75. Chaudhary V, Bano S. Thyroid ultrasound. Indian J Endocrinol Metab [Internet]. 2013 [cited 2019 Jun 8];17(2):219. Available from: http://www.ijem.in/text.asp?2013/17/2/219/109667
76. Blum M. Ultrasonography of the Thyroid [Internet]. Endotext. MDText.com, Inc.; 2000 [cited 2019 May 16]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/25905410
77. Pishdad P, Pishdad GR, Tavanaa S, Pishdad R, Jalli R. Thyroid Ultrasonography in Differentiation between Graves' Disease and Hashimoto's Thyroiditis. J Biomed Phys Eng [Internet]. 2017 Mar [cited 2019 Jun 13];7(1):21–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/28451576
78. Remonti LR, Kramer CK, Leitão CB, Pinto LCF, Gross JL. Thyroid ultrasound features and risk of carcinoma: a systematic review and meta-analysis of observational studies. Thyroid [Internet]. 2015 May [cited 2019 May 16];25(5):538–50. Available from: http://www.ncbi.nlm.nih.gov/pubmed/25747526
79. Alexander EK, Pearce EN, Brent GA, Brown RS, Chen H, Dosiou C, et al. 2017 Guidelines of the American Thyroid Association for the Diagnosis and Management of Thyroid Disease During Pregnancy and the Postpartum. Thyroid [Internet]. 2017 Mar [cited 2019 Jun 13];27(3):315–89. Available from:

https://www.liebertpub.com/doi/10.1089/thy.2016.0457

80. Ross DS, Burch HB, Cooper DS, Greenlee MC, Laurberg P, Maia AL, et al. 2016 American Thyroid Association Guidelines for Diagnosis and Management of Hyperthyroidism and Other Causes of Thyrotoxicosis. Thyroid [Internet]. 2016 Oct [cited 2019 Jun 13];26(10):1343–421. Available from: https://www.liebertpub.com/doi/10.1089/thy.2016.0229

81. Ramtoola S, Maisey MN, Clarke SE, Fogelman I. The thyroid scan in Hashimoto's thyroiditis: the great mimic. Nucl Med Commun [Internet]. 1988 Sep [cited 2019 May 16];9(9):639–45. Available from: http://www.ncbi.nlm.nih.gov/pubmed/2847097

# 6.0 APPENDIX:

## 6.1 INFORMED CONSENT FORM

Consent to participate in the study titled "**Ultrasonography and scintigraphic findings in patients presenting with thyroid disease at Muhimbili National Hospital."**

**Greetings!** My name is **Dr. Hassan M. Barnabas**a postgraduate student at Muhimbili University of Health and Allied Sciences. My supervisor in this study is. Dr. **ZUHURA NKRUMBIH (MD, MMED)** this study is sponsored by Muhimbili University of Health and Allied Sciences

You may be eligible to take part in a research study. This form gives you important information about the study. It describes the purpose of the study, and the risks and possible benefits of participating in the study.

Please take time to review this information carefully. After you have finished, you should talk to me (the researcher) about the study and ask any questions you have. You may also wish to talk to others (for example, your friends, family, or other doctors) about your participation in this study. If you decide to take part in the study, you will be asked to sign this form. Before you sign this form, be sure you understand what the study is about, including the risks and possible benefits to you. Thank you in advance.

Patient's initials; _____
Reg number; _____
Date; _____

**THE PURPOSE OF THE STUDY**

To assess the Ultrasonography and scintigraphy findings in patients presenting with thyroid mass at Muhimbili National Hospital and correlate them with clinical presentations

**VOLUNTARY PARTICIPATION**

Your participation in this study is voluntary. It is up to you to decide whether or not to take part in this study. If you decide to take part in this study, you will be asked to sign a consent form. After you sign the consent form, you are still free to withdraw at any time and without giving a reason. Withdrawing from this study will not affect the relationship you have, if any, with the researcher. If you withdraw from the study before data collection is completed, your data will be returned to you or destroyed

**WHAT PARTICIPATION INVOLVES?**

If you agree to participate in the study, of course after completing all the relevant investigations for your diseases as the entrance criteria, you will be asked some questions concerning your demographic data and your disease.

I have taken steps to minimize the risks of this study. Even so, you may still have problems or side effects, this may include pain, bleeding, and very rarely systemic infections

**BENEFITS**

There will be no direct benefit to you for your participation in this study. However, we hope that the information obtained from this study may help us to closely monitor and carefully managing your diseases

**CONFIDENTIALITY**

Your responses to this study will be anonymous. Please do not write any identifying information in your study. For the purposes of this research study, your comments will not be anonymous. Every effort will be made by the researcher to preserve your confidentiality including the following:

- Assigning code initials and registration numbers for participants that will be used on all research notes and documents
- Keeping notes, interview transcriptions, and any other identifying participant information in a locked file cabinet in the personal possession of the researcher.]

Participant data will be kept confidential except in cases where the researcher is legally obligated to report specific incidents. These incidents include, but may not be limited to, incidents of abuse and suicide risk.

**RISKS**

There is no direct risk associated with this study.

**CONTACT INFORMATION**

If you have questions at any time about this study, or you experience adverse effects as the result of participating in this study, you may contact me or my supervisor through the contact information that I provided on the first page.

OR in case you have questions about your rights of participation in this study you may contact

Dr. Bruno Sunguya, Chairperson of the Senate Research and Publications Committee,

P. O. Box 65001 DSM. Telephone: +2550222152489.

OR Dr. Zuhura Nkurumbii the research supervisor, contacts: +255789384790.Chairperson of Research and Publications,
The Muhimbili University of Health and Allied Sciences (MUHAS)
P.O BOX 65001,
Dar Es SalaamPhone +2550222150302

**MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES,**

**DEPARTMENT OF RADIOLOGY AND IMAGING,**

**P.O BOX 65001, DAR-ES-SALAAM**

**CONSENT FORM;**

Ridhaa ya kushiriki katika utafiti kuhusu" matokeo ya ultrasound Na scintigraphy Kwa wagonjwa wa uvimbe WA goiter katika Hospital ya Taifa Muhimbili "

Habari,,Kwa jina naitwa Dr Hassan M Barnabas, Ni daktari mwanafunzi kutoka chuo kikuu cha afya Na sayansi shirikishi cha muhimbili. Ninafanya tafiti katika kuangalia matokeo ya ultrasound Na scintigraphy Kwa wagonjwa wenye uvimbe WA goiter katika Hospital ya Taifa Muhimbili

**USHIRIKI**

Kama utakubali kujiunga katika utafiti, utahitajika kujibu maswali yote utakayoulizwa Na mtafiti katika usahili

**USIRI**

Taarifa zote zitakazokusanywa kutoka kwako zitahifadhiwa katika hali ya usiri mkubwa, Na hazitatumika Kwa malengo tofauti naya utafiti huu pekee

**MADHARA**

Ni matumaini yetu kuwa hakutakuwa na madhara yatakayokupata wewe kutokana na ushiriki wako katika utafiti huu.Halikadharika,una uhuru wa kujitoa kushiriki pale utakapoamua hivyo.Na kama utaamua kutokushiriki au ukaamua kusitisha kushiriki kwako katika utafiti huu utaendelea kuhudumiwa kama kawaida.Unaweza kusitisha ushiriki wako katika utafiti huu wakati wowote hata kama ukisharidhia kushiriki na endapo kwa sababu yoyote utaamua kurejea kushiriki basi uamuzi wako huo utapokelewa kwa moyo mkunjufu.Endapo utakataa kushiriki au utaamua kujitoa kushiriki katika utafiti huu,haitapelekea wewe kuadhibiwa au kunimwa stahiki zako za kimatibab

**MANUFAA**

Utakaposhiriki katika utafiti huu, utakuwa umechangia kupatikana Kwa taarifa zitakazosaidia kuongeza ubora WA huduma wanazopewa wagonjwa wa uvimbe wowote wa goiter Na pia kuboresha Zaidi matibabu yako kwa kupunguza uwezekano wa kupata vifo vya ghafla

Maelezo yako pamoja naya washiriki wengine Kwa pamoja yatatumiwa Na watunga sera za afya katika kuboresha maeneo yenye upungufu na kuwezesha kutoa huduma zilizo bora zaidi

Kwa mawasiliano zaidi kuhusu utafiti huu wasiliana Na;

Dr Hassan M.Barnabas, MD, Radiology Resident (Mtafiti mkuu)

Shule ya tiba (MUHAS)

P.O BOX 65001 DSM

Namba ya simu 0718055721, 0622628150 Au

Dr Zuhura Nkrumbih, MD, MMed Radiology (Msimamizi WA Utafiti)

Namba ya simu +255789384790

Aidha kwa maswali zaidi kuhusu haki zako kama ushiriki wa utafiti huu, unaweza kuwasiliana na Dkt. Bruno Sunguya: Mwenyekiti wa kamati ya Utafiti na Uchapishaji, S.L.P 65001,Dar es Salaam. Simu:+2550222152489

Je unakubali kushiriki? Andika neno “Ndiyo”Kama unakubali…….Mimi……..nimesoma Na kuelewa yaliyomo katika fomu hii.Maswali yangu yamejibiwa.Ninakubali kushiriki katika utafiti huu

Sahihi ya mshiriki…….

Sahihi ya mtafiti…….

Tarehe iliyosainiwa fomu ya ridhaa……

**MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES,**

**DEPARTMENT OF RADIOLOGY AND IMAGING,**

**P.O BOX 65001, DAR-ES-SALAAM**

**QUESTIONNAIRE**

Questionnaire number……...Date of interview……...

A; DEMOGRAPHIC DATA

Registration No……Age (years) ……

Sex ……Address……

B. MAIN COMPLAINTS

1. Chief complaint(s)

a) Neck swelling (diffuse) Yes….. / No……

b) Neck mass (unilateral or bilateral) Yes….. / No……

c) Dysphagia Yes….. / No……

d) Neck pain Yes….. / No……

e) Hoarseness Yes….. / No……

f) Others ……

……..

2. Have you ever had all or part of your thyroid gland surgically removed?

Yes (specify)……

No……..

4. Are you currently in any medications for thyroid disease?

i. Yes (specify).

ii. No ……

E. USS FINDINGS

1. Calcification

A. Microcalcification. Yes …….. No……

B. Macro calcification Yes…….. No……

C. Coarse Calcification Yes ……. / No……

D.Peripheral rim Calcification Yes ……. / No……

2. Echogenicity

A. Hypoechoic solid nodule Yes ……. / No…….

B. Isoechoic solid nodule Yes…….. / No……..

C. Hyperechoic Yes…… / No……..

D. Cystic component Yes…….. / No ……

E. Halo around a well-marginated hyper or isoechoic nodule Yes…../ No……

3. Echotexture

A. Homogenous echotexture Yes……. No…….

B. Heterogeneous echotexture Yes……. No…….

4. Intraparenchymal color flow on Doppler

A.Increasedcolor flow Yes……../ No……

B.Decrease color flow Yes……. /No…….

5. Invasion of local structure Yes…../ No……..

6. Nodule taller than its wide Yes …../ No ……

7. Nodule wide than its taller Yes…../ No…….

8. Margins

A. Regular Yes…../No……

B. Irregular Yes…../No…….

9. Lymph node

A. Present (Enlarged)Yes ……/ No…….

B. Micro calcificationYes…../ No…….

C. Lymph Node with cystic change Yes…. /No…..

10. Thyroid lobe Size enlarges Yes…../ No……

F. Radionuclide scintigraphy findings

a) Cold nodule…….

b) Hot nodule……..

c) Warm nodule……

(TOLEO LA KISWAHILI)

Nambari za maswali ……
Tarehe ya mahojiano ……

A. TAARIFA ZA AWALI
JINA LA MGONJWA: _____
NAMBA YA USAJILI: _____
UMRI:_____
JINSIA: _____
ANWANI
KIWANGO CHA ELIMU: _____
MAHUSIANO: _____

B. MALALAMIKO YA MGONJWA

1. Malalamiko kuu
a) Kuvimba shingo
b) Uvimbe shingoni
c) Maumivu wakati wa kumeza chakula
d) Kuumwa shingo
e) Mabadiliko ya sauti (ya mkwaruzo)
f) Mengineyo

2. Muda
3. Ushawahi kufanyiwa upasuaji wa kuondoa tezi ya thairoidi au baadhi ya sehemu yake?
Ndio (changanua) _____
Hapana_____

4. Je kwa sasa upo kwenye matibabu ya ugonjwa wa tezi ya thairoidi?
Ndio (taja) _____
Hapana

D. MATOKEO YA MAABARA
a) T3
b) T4
c) TSH
d) Ant-thyroglobulin

E. MATOKEO YA USS
a)
b)
c)
d)

F. MATOKEO YA SCINTIGRAPHY
a)
b)
C
d)